Is this second degree atrioventricular heart block?

VIVIENNE MILLER MB BS, FRACGP, DRACOG, DCH, MACPM, MWAME

ECG Education articles are inspired by, but not based on, real cases to illustrate the importance of knowledge about ECGs in relation to clinical situations in general practice. Management is not discussed in detail.

Helen is a 65-year-old woman who is well known to you. She comes to see you at your practice because she has been feeling faint when she does simple housework and especially if she exerts herself physically. This has been happening for a week but she has had no other symptoms. She has been taking perindopril plus indapamide daily for 10 years for hypertension. This medication was last increased to 5 mg/1.25 mg two years ago. She is clinically obese but has no other medical conditions.

Helen is not an active person but since the birth of her first granddaughter 12 months ago, she has been exerting herself more. The only abnormality found on examination is that her pulse rate is regularly irregular and there is a mild bradycardia of 55 beats per minute. There is no significant postural drop in blood pressure. You organise an urgent ECG and review it immediately.

Q1. What does Helen's ECG show (see below)?
Mobitz type II heart block.

Q2. What are the different types of heart block?
First degree heart block; second degree Mobitz type I atrioventricular block (Wenckebach); second degree Mobitz type II atrioventricular block, and third degree (complete) heart block.

Q3. What is first degree heart block?
First degree heart block is the least dangerous type of block and is due to delayed conduction of the electrical impulse through the conduction system. As a result, the PR interval is over 0.2 seconds long. Type I heart block requires no treatment. Although it can occur in very fit individuals from enhanced vagal tone, it may also signify underlying heart disease, or be caused by atrioventricular nodal blocking medications.

Q4. What are the two types of second degree heart block?
Second degree atrioventricular heart block is either Mobitz type I (Wenckebach) or Mobitz type II. Mobitz type I is the more common form of second degree heart block. The PR interval becomes progressively prolonged over a number of heart beats until a P wave is not conducted. There is then a pause, when the P wave is blocked. This pause is usually less than the sum of the previous two beats. The next beat then begins with a shortened PR interval, the hallmark of diagnosis after the

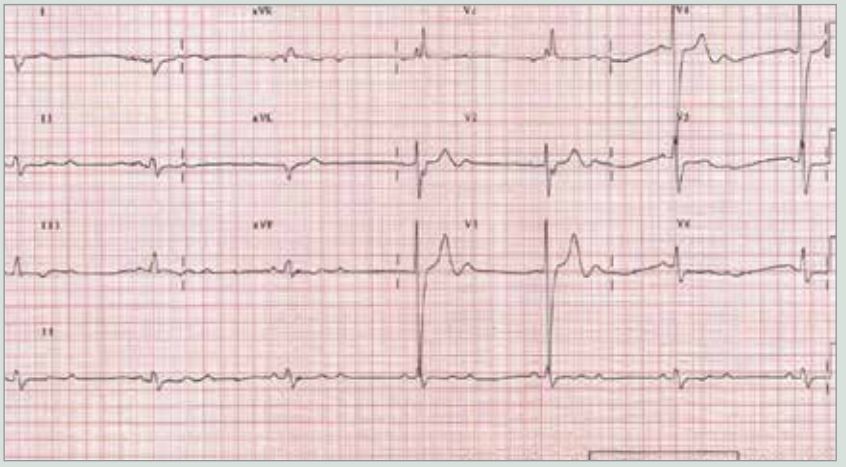

Figure. This ECG is consistent with 2:1 atrioventricular block (and therefore Mobitz type II atrioventricular block). It may be a rare example of Mobitz type I atrioventricular block (Wenckebach), but this would usually present with 3:2 or 4:3 block, rather than 2:1. In addition, the right bundle branch block suggests infranodal disease and makes it more likely that this is a Mobitz type II atrioventricular block.

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Dr Miller is a GP in Sydney, NSW. She is also an editor, author and medical journalist and is the Medical Editor of *Cardiology Today*.

pause, and the cycle may begin again. There may also be junctional escape beats seen where the P waves are not conducted.

Mobitz type II heart block is more dangerous and usually indicates disease of the conduction system below the atrioventricular node. The PR interval is fixed, but there is a regular nonconduction of the P wave. This pause is exactly twice the length of the sinus cycle. When conduction recommences, the PR interval is the same as before nonconduction.

Q5. How does the level of second degree atrioventricular heart block alter the prognosis?

The level of second degree heart block may be atrioventricular nodal or infranodal (the latter directly involves the His-Purkinje conduction system). Mobitz type I heart block more often affects the atrioventricular node and, if so, is unlikely to progress to Mobitz type II heart block or complete heart block. If the QRS complex is very narrow, this suggests Mobitz type I heart block as arising from the atrioventricular node; if the QRS complex is widened, it is more likely to arise from the infranodal region. A Mobitz type II heart block that has a widened QRS complex is almost always from the infranodal region. Both Mobitz type I and Mobitz type II heart block that involve the infranodal region may progress to complete heart block.

Q6. What are the causes of second degree heart block?

The causes of second degree heart block include the following: medications (such as beta blockers, digoxin, calcium antagonists and some antiarrhythmic agents); myocardial infarction; myocardial ischaemia and fibrosis; endocarditis and myocarditis; hyperkalaemia and hypermagnesaemia; hyperthyroidism and severe hypothyroidism; complications of valvular heart disease (especially aortic stenosis); cardiac surgery and catheter ablation procedures; cardiomyopathy; muscular dystrophies; acute alcoholic poisoning; obstructive sleep apnoea; some connective tissue diseases (e.g. lupus erythematosus, rheumatoid arthritis, ankylosing spondylitis); infiltrative conditions (e.g. haemochromatosis, sarcoidosis, lymphoma, amyloidosis); and cardiac tumours.

Q7. What are the symptoms of untreated second degree heart block?

There may be no symptoms at all, especially in otherwise healthy individuals with no structural cardiac disease. Dizziness, faintness, reduced exercise tolerance, angina with exertion and syncope may all occur and are more likely in Mobitz type II atrioventricular block. Symptoms may be related to hypotension from reduced cardiac output and/or from failure to increase heart rate with exertion. The pulse may be bradycardic (less than 60 beats per minute) and may be regularly irregular.

Q8. What is the differential diagnosis of second degree heart block?

When considering the differential diagnosis, the sinus rate is important. Increased vagal tone may cause bradycardia and atrioventricular block and, especially if the patient is symptomatic, this may appear to be a Mobitz type II atrioventricular block. If there is doubt about the diagnosis, invasive His bundle recording is required for diagnosis of a possible infranodal block.

Q9. What investigations and management are advisable for Helen?

Helen should be sent to hospital by ambulance as soon as possible (in case she develops complete heart block). She should have her serum urea, electrolyte, calcium and magnesium levels measured and also undergo thyroid function testing and cardiac echocardiography. She should have cardiac monitoring during her admission. She may require an isoprenaline infusion to help sustain heart rate. If she has electrolyte abnormalities, the diuretic she takes should be stopped. As she is symptomatic she is likely to require a permanent pacemaker.

Outcome

Helen was admitted to hospital and did not require electrophysiological studies because her ECG and monitoring showed a broad QRS and persistent Mobitz type II atrioventricular block (most likely originating from the His-Purkinje region). There was no reversible cause found for this and so Helen received a permanent pacemaker. **CT**

Key points

- **Second degree atrioventricular heart block is either Mobitz type I (Wenckebach) where the PR interval becomes progressively prolonged over a number of heart beats until a P wave is not conducted, or Mobitz type II where the PR interval is fixed but there is a regular nonconduction of the P wave.**
- **Mobitz type I is more common, and Mobitz type II is more dangerous.**
- **Both Mobitz type I or II that involve the infranodal region may progress to complete heart block.**
- **The common causes of second degree heart block include use of medications, myocardial disease, electrolyte disorders, thyroid disease and aortic valvular disease.**
- **Patients with symptomatic heart block (dizziness, faintness, reduced exercise tolerance, angina with exertion and syncope) are likely to require a permanent pacemaker.**